We claim:

1. A method of making optical quality films, comprising the steps of:

depositing a first silica film on a wafer by PECVD (Plasma Enhanced Chemical Vapor Deposition);

subjecting the wafer to a first heat treatment to reduce optical absorption, wafer warp, and compressive stress;

depositing a second silica film on the wafer by PECVD; and

subsequently subjecting the wafer to a second heat treatment to reduce optical absorption, wafer warp and tensile stress.

2. A method as claimed in claim 1, wherein the first heat treatment follows a predetermined temperature profile.

3. A method as claimed in claim 2, wherein said first heat treatment comprises a first phase in which said wafer is stabilized at a first predetermined temperature, a second phase in which the temperature is ramped up to a second predetermined temperature, a third phase in which the temperature is maintained at said second predetermined temperature, a fourth phase in which the temperature is ramped down to a final temperature, and a fifth phase in which the wafer is stabilized at said final temperature.

4. A method as claimed in claim 3, wherein the duration of said first phase lies in the range 1.3 to 130 minutes.

5. A method as claimed in claim 3, wherein the duration of said first phase is about 13 minutes.

6. A method as claimed in claim 3, wherein the temperature in said second phase is ramped up at a rate lying in the range 1°C/min to 25°C/min...

7. ~~6.~~ A method as claimed in claim 3, wherein the temperature in said second phase is ramped up at 5°C/min.

8. ~~7.~~ A method as claimed in claim 3, wherein said first predetermined temperature lies in the range 300°C to 700°C.

9, ~~8~~. A method as claimed in claim 7, wherein said first predetermined temperature is about 400°C.

10, ~~9~~. A method as claimed in claim 8, wherein the temperature in said fourth phase is ramped down at a rate in the range 1°C/min. to 25°C/min.

11, ~~10~~. A method as claimed in claim 9, wherein the temperature in said fourth phase is ramped down at 2.5°C/min.

12, ~~11~~. A method as claimed in claim 3, wherein said second predetermined temperature lies in the range 800°C to 1,300°C.

13, ~~12~~. A method as claimed in claim 11, wherein said second predetermined temperature is about 900°C.

14, ~~13~~. A method as claimed in claim 1, wherein said first and second heat treatments are carried out in the presence of an inert gas.

15, ~~14~~. A method as claimed in claim 1, wherein said inert gas is selected from the group consisting of: nitrogen, N_2, oxygen, O_2, hydrogen, H_2, water vapour, H_2O, argon, Ar, fluorine, F_2, carbon tetrafluoride, CF_4, nitrogen trifluoride, NF_3, andhydrogen peroxide, H_2O_2

16, ~~15~~. A method as claimed in claim 13, wherein the flow rate of said inert gas is constant.

17, ~~16~~. A method as claimed in claim 15, wherein the flow rate of said inert gas lies in the range 1 liter/min. to 100 liters/min.

18, ~~17~~. A method as claimed in claim 3, wherein the second heat treatment follows a predetermined temperature profile.

19, ~~18~~. A method as claimed in claim 17, wherein said second profile follows the same form as said first profile.

20. ~~19~~. A method as claimed in claim 10, wherein deposition is carried out in a seven-dimensional space wherein the flow rates of raw material gas, oxidation gas, carrier gas and dopant gas are set at fixed values, the total deposition

pressure is set at a fixed value, a post-deposition thermal treatment is carried out at a temperature selected from a group of predetermined temperatures, and the observed FTIR characteristics of the resulting product are used to determine the post deposition thermal treatment temperature.

21. ~~20~~. A method as claimed in claim 19, wherein a first independent variable, the SiH_4 flow, is fixed at about 0.20 std litre/min; a second independent variable, the N_2O flow, is fixed at about 6.00 std litre/min; a third independent variable, the N_2 flow, is fixed at about 3.15 std litre/min; a fourth independent variable, the PH_3 flow, is fixed at about 0.50 std litre/min; a fifth independent variable, the total deposition pressure, is fixed at about 2.60 Torr; a sixth independent variable, the post-deposition thermal treatment is varied among the following choices: 30 minutes duration thermal treatment in a nitrogen ambient at 600°C; 30 minutes duration thermal treatment in a nitrogen ambient at 700°C; 30 minutes duration thermal treatment in a nitrogen ambient at 750°C; 30 minutes duration thermal treatment in a nitrogen ambient at 800°C; 30 minutes duration thermal treatment in a nitrogen ambient at 850°C; 30 minutes duration thermal treatment in a nitrogen ambient at 900°C.

22. ~~21~~. A method as claimed in claim 1, wherein the first layer is a silica buffer layer and the second layer is a silica core layer.

23. ~~22~~. A method as claimed in claim 21, wherein a second buffer layer, symmetrical with said first-mentioned buffer layer, is deposited on the back side of the wafer.

24. ~~23~~. A method as claimed in claim 22, wherein a protective layer is deposited on the back face of the buffer layer on the back side of the wafer and a compensating layer is deposited on the front face of the wafer.

25. ~~24~~. A method as claimed in claim 24, wherein the protective layer and compensating layer are silicon nitride.

26. ~~25~~. A method of making a photonic device by PECDV (Plasma Enhanced Chemical Vapor Deposition) comprising:

a) depositing a thick first silica buffer layer on the back side of a wafer;

b) depositing a thick silica buffer layer on the front side of said wafer;

c) subjecting the wafer to a first heat treatment to reduce optical absorption, wafer warp, and compressive stress;

d) depositing a silica core layer;

e) subsequently to step *d* subjecting the wafer to a second heat treatment to reduce optical absorption, wafer warp and tensile stress; and

f) depositing a silica cladding layer on said silica core layer.

27, ~~26~~. A method as claimed in claim 25, wherein said first and second heat treatments follow a predetermined profile and comprises a first phase in which said wafer is stabilized at a first predetermined temperature, a second phase in which the temperature is ramped up to a second predetermined temperature, a third phase in which the temperature is maintained at said second predetermined temperature, a fourth phase in which the temperature is ramped down to a final temperature, and a fifth phase in which the wafer is stabilized at said final temperature.

28, ~~27~~. A method as claimed in claim 26, wherein a sacrificial layer is deposited on the front side of the wafer prior to step *a*, an etch protective layer is deposited on said buffer layer on the back side of said wafer, said sacrificial layer is removed after depositing said etch protective layer, and a compensating layer is deposited on the front face of the wafer prior to step *b*.

29, ~~28~~. A method as claimed in claim 27, wherein said sacrificial layer is silica.

30, ~~29~~. A method as claimed in claim 28, wherein said protective layer and said compensating layer are silicon nitride.

31, ~~30~~. A method as claimed in claim 25, wherein said photonic device is a deep-etched optical component.